What is claimed is:

1. A method of characterizing an optical system comprising:

projecting the image of a reticle positioned in a reticle plane and having a periodic pattern thereon with the optical system;

detecting the image of the periodic pattern in a plane oblique to the reticle plane; and

analyzing the image of the periodic pattern to obtain information characterizing the optical system.

2. A method of characterizing an optical system as in claim 1 wherein:

the periodic pattern is a grating.

3. A method of characterizing an optical system as in claim 1 wherein:

the periodic pattern is a plurality of gratings.

4. A method of characterizing an optical system as in claim 3 wherein:

the plurality of gratings comprises basket weaves, vertical lines, horizontal lines, and tilted lines.

5. A method of characterizing an optical system as in claim 4 wherein:

a central portion is formed of repeating vertical lines, horizontal lines, and tilted lines.

6. A method of characterizing an optical system as in claim 5 wherein:

the central portion is bounded by basket weaves.

7. A method of characterizing an optical system as in claim 1 wherein:

the image is recorded on a photosensitive substrate.

8. A method of characterizing an optical system having an optical axis comprising:

projecting an image of a reticle having a periodic pattern thereon through the optical system;

detecting the image of the reticle simultaneously at different locations and in a direction coaxial with the optical axis; and

analyzing the image to obtain characterization of the optical system.

9. A method of characterizing an optical system as in claim 8 wherein:

the periodic pattern comprises a plurality of rows of vertical, horizontal, and tilted lines.

10. A method of characterizing an optical system as in claim 8 wherein:

the step of analyzing comprises using interferometry.

11. A method of extracting optical parameters from an optical system having an optical axis comprising the steps of:

illuminating periodic patterns in an object plane of the optical system;

imaging the periodic patterns via the optical system;

intercepting and recording the image of the periodic patterns in an image volume of the optical system; and

analyzing a recorded image of the periodic patterns formed within the image volume,

whereby optical system parameters are extracted.

3K 12. A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is tilted within the image volume.

3K 13. A method of extracting optical parameters from an optical system as in claim 11 wherein:

the object plane is tilted with respect to the optical axis,

whereby a continuum of object positions as a function of field position is generated.

3K 14. A method of extracting optical parameters from an optical system as in claim 13 wherein:

the recorded image is tilted with respect to the optical axis.

3K 15. A method of extracting optical parameters from an optical system as in claim 11 wherein:

the object plane and the recorded image are tilted orthogonally,

whereby a continuum of object positions in one axis and focus positions in another orthogonal axis is generated.

16. A method of extracting optical parameters from an optical system as in claim 12 wherein:

an envelope of feature resolution through focus is extracted.

17. A method of extracting optical parameters from an optical system as in claim 12 wherein:

astigmatism of the optical system is extracted as a function of periodic pattern orientation.

18. A method of extracting optical parameters from an optical system as in claim 12 wherein:

coma of the optical system is extracted as a second order distortion signature versus focus mapped across the field.

19. A method of extracting optical parameters from an optical system as in claim 12 wherein:

spherical aberration of the optical system is extracted as a function of best focus difference between line sizes of the periodic pattern versus field position.

20. A method of extracting optical parameters from an optical system as in claim 12 wherein:

optimum reticle or object position is extracted as a function of field position of minimum spherical aberration as seen by minimum best focus difference between line sizes.

21. A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is analyzed using a dark field microscope.

34 22. A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is analyzed using white light.

23. A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is analyzed using a laser microscopic interferometer.

24. A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is analyzed in a single exposure using a large aperture interferometer.

25. A method of extracting optical parameters from an optical system as in claim 11 wherein the act of analyzing further comprises:

calculating best focus position.

26. A method of extracting optical parameters from an optical system as in claim 11 wherein the act of analyzing further comprises:

calculating spherical aberrations.

27. An apparatus for characterizing an optical system comprising:

an optical system;

illumination means for projecting an image of a reticle having a periodic pattern thereon within a volume of image space;

means for detecting the image at different locations comprising different depths of focus within the volume of image space;

means for analyzing the image and determining optical system imaging characteristics.

28. An apparatus for characterizing an optical system as in claim 27 wherein:

said means for analyzing the image and determining optical system imaging characteristics comprises analyzing interference patterns created by the image.

29. An apparatus for characterizing projection optics used in photolithography to project the image of a reticle onto a photosensitive substrate comprising:

an illumination system;

a reticle placed in a reticle plane, said reticle having a plurality of rows containing periodic patterns thereon comprising a basket weave, vertical lines, horizontal lines, and tilted lines;

an image volume;

a photosensitive substrate positioned in an image plane within said image volume, said image plane being oblique to the reticle plane;

an interferometer, said interferometer positioned to view the recorded image on said photosensitive substrate of said plurality of rows containing periodic patterns thereon; and

an optical system characterizor coupled to said interferometer,

whereby the imaging parameters of the projection optics are obtained in a single exposure and acquisition step.

30. A method of detecting and measuring properties of an optical system comprising the steps of:

positioning a photosensitive receptor at different focal positions in a volume of image space of the optical system;

imaging a plurality of periodic patterns projected by the optical system onto the photosensitive receptor;

recording the image of the plurality of periodic patterns;

detecting with an interferometer the recorded plurality of periodic patterns; and

calculating properties of the optical system based upon said step of detecting the recorded plurality of periodic patterns,

whereby the optical system is characterized at multiple locations in a field simultaneously.

31. A method of detecting and measuring properties of an optical system as in claim 30 wherein:

the properties are aberrations of the optical system mapped at different locations.

32. A method of detecting and measuring distortion in an optical system comprising the steps of:

projecting a cross periodic pattern with the optical system into a volume of space through focus; and

interferometrically analyzing the cross periodic pattern projected through focus,

whereby changes in pitch of the cross periodic pattern are detected and the optical system is characterized.

33. A method of determining the position of best focus in an optical system comprising the steps of:

tilting a photosensitive substrate in a first plane at a first angle to intercept the depth of focus of the optical system at a first location;

exposing the photosensitive substrate with a pattern to form a first exposed band laying across the substrate;

shifting the photosensitive substrate a known distance to a second location;

exposing the photosensitive substrate with a pattern to form a second exposed band laying across the substrate; and

calculating the location of the best focus based upon the first and second locations of the first and second exposed bands laying across the substrate.

34. A method of detecting spherical aberrations of an optical system comprising the steps of:

projecting a periodic pattern with the optical system onto a resist covered substrate tilted through focus;

detecting the height profile of processed resist exposed to said periodic pattern; and

detecting asymmetries in the height profile of the processed resist,

whereby the asymmetries are representative of spherical aberrations of the optical system.

35. A method of determining placement of a reticle in an optical system comprising the steps of:

tilting a reticle having different line widths thereon in a first plane about a first axis;

tilting a photosensitive substrate in a second plane about a second axis, the second axis being skewed relative to the first axis;

exposing said photosensitive substrate with an image of the reticle through the optical system;

determining a locus of best focus for each line width; and

obtaining the placement of the reticle based upon the intersection of the locus of best focus for each line width.

36. A method of determining placement of a reticle as in claim 35 wherein:

the first axis is orthogonal to the second axis.

37. A method of determining placement of a reticle as in claim 35 wherein:

the different line widths are interlaced.

38. A method of determining placement of a reticle as in claim 35 wherein:

the different line widths are interlaced and are orthogonal.